



Refurbishing high rise
dwellings – a strategic guide
for local authority managers



Introduction

Home energy use is responsible for 27 per cent of UK carbon dioxide emissions which contribute to climate change. By following the Energy Saving Trust's best practice standards, new build and refurbished housing will be more energy efficient – reducing these emissions and saving energy, money and the environment.

Local authorities have a vital role to play in local sustainable energy strategies. However, limited funding and powers, together with gaps in national scheme coverage, present special challenges.

The aim of this guide is to explain the benefits of a strategic approach to energy efficient refurbishment and to help local authorities identify the main best practice opportunities for high rise dwellings. It also serves as a signpost to further information.

This guide covers:

- The benefits of making dwellings energy efficient.
- The benefits of a strategic approach to energy efficient refurbishment.
- The main types of high rise construction.
- The assessment of priorities.
- The importance of engaging residents.
- How to fund improvements.
- The most appropriate measures and the main opportunities for implementing them.
- Sources of further information.

Energy efficient dwellings

Energy efficient dwellings bring economic, environmental and social benefits to local authorities, tenants and the wider community.

Energy efficient dwellings:

- Improve tenants' quality of life by enabling them to maintain a comfortable and easily controlled household temperature at reasonable cost, thereby

reducing the incidence of cold and damp related illness.

- Help tackle fuel poverty and rent arrears by reducing tenants' fuel bills.
- Help reduce the number of hard-to-let properties by making dwellings more attractive to prospective tenants.
- Add value to the housing stock.
- Improve the SAP (Standard Assessment Procedure) profile of the housing stock, helping to meet key best value performance measures.
- Reduce CO₂ emissions – helping to meet local Home Energy Conservation Act (HECA) and national CO₂ reduction targets.
- Cut the capital cost of heating installations, as more energy efficient buildings require less heating.
- Reduce condensation and mould growth.
- Are less draughty and more comfortable. They are likely to cause less complaints, resulting in reduced management costs of dealing with them and carrying out repair work.

High rise construction

Many local authorities, especially in large towns and cities, responded to the demand for housing in the 1960s and 70s by building blocks of flats. High rise – usually defined as blocks of six or more floors served by lifts – commonly take the form of:

- Point blocks – with internal access to four or six flats per floor.
- Slab blocks – with internal access to eight or more flats per floor. An external gallery access at every second floor gives access to eight or more maisonettes.

There are many variations of these basic types.

Descriptions of several follow, together with energy efficiency measures that could be implemented and associated savings.

Construction characteristics

High rise construction may exhibit any of the following characteristics:

- Poor thermal performance compared with current regulations.
- Out of date and inefficient community heating networks, with no controls in individual dwellings.
- Internal bathrooms with poorly-maintained extract ventilation.
- Condensation and mould growth.
- Flat roofs with a three-layer bituminous felt or asphalt covering. Leaks are temporarily patched.
- Poor roof insulation.
- Concrete or brick spalling. Reinforcement and wall ties corroding.
- Single glazed windows with warped sashes and no draughtstripping. The twisted opening sashes and very high exposure give rise to a high rate of complaints about leaks and draughts.
- Excessive heat loss through very large windows giving onto balconies.
- Balconies and access galleries frequently form thermal bridges, with continuous floors and/or walls from inside the dwelling to outside.

Column and beam

- In situ concrete column and beam frame.
- In situ concrete floor slab.
- Brick cavity external walls.
- Various heating systems but commonly underfloor electric.



Box frame

- In situ concrete box-frame (or 'egg-crate').
- Brick cavity or precast concrete panel infill external walls.
- Various heating systems but commonly underfloor electric.



No-fines

- In situ no-fines solid concrete walls.
- External brick skin or render.
- In situ concrete floors.
- Various heating systems but commonly underfloor electric or traditional storage heaters.



Large panel systems (LPS)

- Precast concrete, prefabricated room-sized.
- Wall and floor panels.
- External wall panels, smooth textured or exposed aggregate finishes.
- Windows may be cast into wall panels.
- Various heating systems – commonly gas or electric warm air, or traditional storage heaters.



Benefits of a strategic approach



To ensure cost effective, energy efficient improvement of dwellings, it is necessary to take a strategic approach. This should take account of a number of European, national and local strategies and standards:

- The UK Fuel Poverty Strategy (Defra).
- Local authority Home Energy Conservation Act 1995 (HECA) strategies.
- The Decent Homes standard (England and Northern Ireland), the Scottish Housing Quality Standard and the Welsh Housing Quality Standard.
- The UK Climate Change Programme (Defra).
- The EU Energy Performance of Buildings Directive (EPBD) due to be implemented from 2006 (ODPM).

A housing energy strategy can enable local authorities to:

- Identify and access additional external resources.
- Prioritise refurbishments to ensure the cost effective allocation of resources.
- Minimise capital costs by integrating energy efficiency programmes within existing repair and improvement cycles.
- Raise awareness of energy efficiency amongst all staff.
- Promote energy efficiency as a way of achieving broader aims, such as making hard-to-let properties more attractive to prospective tenants.
- Make quantifiable progress towards eradicating fuel poverty.
- Measure the savings in CO₂ emissions for the housing stock – helping to meet targets and allowing comparison with benchmarks and national standards.



Assessing priorities

To develop an effective energy efficiency strategy local authorities need to address the following:

- Housing stock assessment.
- Delivery of affordable warmth.
- Energy training for staff.
- Energy advice for tenants.
- Integration of energy efficiency into broader housing management activity.
- Consideration of community heating and combined heat and power (CHP).
- Integration of renewable energy systems.
- Securing funding for energy efficiency work.

More detailed advice on all of the above issues can be found in Energy Efficiency: The Guide (see Further reading).

Housing stock assessment

First, it is crucial to establish the current level of energy efficiency across the housing stock through the creation of a comprehensive housing stock energy database (or more graphical housing stock profiles).

The current efficiency of the housing stock provides a baseline against which targets can be set and progress measured. Accurate modelling of planned or proposed improvement measures across the whole stock can then be undertaken and the cost-effectiveness of individual measures gauged.

Energy surveys should be carried out to establish the current situation, perhaps at the same time as stock condition surveys in order to reduce the cost. In fact, as cost is likely to prohibit energy surveys of each property, a representative sample of properties covering all construction types should be chosen.

This sample survey should identify those dwelling types that are most in need of improvement. More detailed surveys on these will provide more accurate dwelling-specific information. Additional information can also be gleaned from other sources within the local authority, for example from existing repair and maintenance databases. Procedures need to be put in place to ensure regular updating and reporting from this database. The ideal would be to have a database covering 100 per cent of the stock with an energy rating calculated for every dwelling, although this is rarely practical.

Strategic performance indicators

- Standard Assessment Procedure (SAP)
- National Home Energy Rating (NHER)
- Estimated CO₂ emissions
- Estimated energy use
- Affordable warmth index

An **energy rating** provides a simple expression of the energy efficiency of a dwelling. It offers a means of comparing dwellings, either singly or in groups. The same dwelling(s) can be compared before and after improvements.

The SAP is the Government's home energy rating system. Based on BRE's domestic energy model (BREDEM), it is a way of reliably assessing the energy efficiency of dwellings. SAP ratings are expressed on a scale of 1 to 100 – the higher the number the better the standard. A similar rating scale assesses environmental impact based on CO₂ emissions.

From early 2006 the current version of SAP is SAP2005 (www.bre.co.uk/sap2005). There are a number of companies that provide SAP ratings for new and existing properties.

There are a number of databases available which generate the strategic performance indicators (see box) most local authorities require. They can also produce more operational performance indicators, for example the numbers of measures installed, which can be useful to housing management and maintenance departments.

The availability of up to date energy information will become more important with the implementation of the EPBD.

Delivering affordable warmth

The best way forward is an affordable warmth programme which addresses the following questions:

- What can tenants afford to spend on fuel?
- What target should be set for heating costs?
- How far short of that target is the stock?
- What energy consumption targets could be met through installation of energy efficiency measures?

The housing stock assessment will identify those dwellings which should be prioritised for upgrading in order to meet the target.

Community heating

A community heating scheme provides heat from a central source to more than one building or dwelling via a network of heat mains. The system may employ conventional boilers or boilers using renewable energy sources. If the waste heat from power generation can be used, the scheme is referred to as Combined Heat and Power or CHP.

The greatest potential for community heating in existing dwellings lies in high rise buildings (defined as more than six stories). There are some 942,000 high rise dwellings in the UK; of these 245,000 have electric heating and 105,000 already have a heat network. These are prime candidates for refurbishment. There are currently 126,000 high rise properties without central heating.

From 2006, the EU Energy Performance of Buildings Directive will require developers of all new buildings and major refurbishments (with more than 1,000m² of floor area) to show they have considered CHP, renewables and connection to a heat network. The best way of doing this is to conduct an Option Appraisal.

For further information on community heating, see the Further Information section.

When energy efficiency measures are included in wider modernisation or refurbishment works, decisions about financial priorities, standards, design and detail need to be coordinated under a policy based on affordable warmth targets. Different departments within a local authority will have their own targets. If their combined actions are to be effective and efficient, it is vital that policy is clear and practical and covers all relevant aspects. Opportunities for improving energy efficiency should be built into the general strategy.

The best opportunity for improving energy performance occurs when full conversion work takes place. However, energy measures should also be considered when repair or replacement is necessary, or where other alterations necessitate changes to structures or finishes (see table on page 11). For example, if extensive repairs have to be made to the exterior of a high rise block, it may be cost effective to include external insulation, or cavity wall insulation where appropriate, as part of an upgraded finish. Combining measures and programmes will often result in reduced costs and streamlined installation procedures.

The primary objective must be to insulate the fabric of the dwelling. A new central heating system in an uninsulated flat may produce greater comfort, but the additional fuel costs may be beyond the tenant's ability to pay.



Engaging residents

Residents should be consulted before refurbishment. The need to upgrade the energy efficiency of the dwellings should be clearly explained in terms of:

- Improved comfort standards.
- Reduced annual running costs and residents' bills.
- Maintaining the dwelling in good condition.
- Reducing CO₂ emissions (along with other greenhouse gases) thus protecting the environment.

Wherever possible, a complete package of energy measures should be installed, as partial upgrading can lead to problems elsewhere (for example, installing well-sealed, double-glazed windows can result in condensation on cold bedroom walls in the absence of other measures).

Residents should be fully informed about the improvement options, the capital costs involved and the benefits that will ensue. It should be made clear how the capital costs will be met. Agreement will be easier to achieve when tenants are properly informed and have participated in the selection of priorities.

A full upgrade package will have to be explained in detail, not only immediately after installation, but also subsequently in follow-up visits. The areas to be covered include:

- Heating systems.
- The setting of heating controls such as programmers, room thermostats and thermostatic radiator valves.
- The control of ventilation.
- Minimising the causes of condensation.
- Who to contact for further advice.



Residents will need help in understanding how the ventilation of their dwelling works and the most economic and effective way to control their new heating system. They will then gain substantial benefits in terms of both comfort and costs. If they do not understand how the systems work, they may incur fuel bills beyond their ability to pay, or they may not use the heating at all and then the dwelling will become cold and damp again.

Any organisation giving specific energy efficiency advice to occupants should have signed up to the Energy Saving Trust's Domestic Energy Efficiency Advice Code of Practice (see page 11). This will ensure that residents receive accurate and relevant advice.

If organisations contract others to provide energy efficiency advice on their behalf, they should specify only those organisations who meet the standards of the Code of Practice. This ensures accurate and consistent advice for tenants.

Funding improvements

By July 2005, each stock-holding local authority was required to carry out an Option Appraisal on their housing stock. This involved examining the cost of bringing the stock up to the Decent Homes standard by 2010, and developing strategies to implement it.

Councils needing additional funding to improve their housing stock could choose between several options, with the decision being taken in partnership with tenants. The options were:

- **Whole stock transfer** to one or more new or existing Residential Social Landlords (RSLs) – thereby attracting private finance from lenders.
- **Partial stock transfer** to one or more new or existing RSLs – again attracting private finance from lenders.
- Setting up **arms-length management organisations (ALMOs)**. An ALMO is a company set up to manage and improve all or part of its housing stock. The Local Government White Paper proposes new flexibility on borrowing and rent retention for councils that set up ALMOs. High performing ALMOs are also eligible for additional Government funding.
- **Attracting income through the Private Finance Initiative (PFI)**. The PFI is the most successful Public-Private Partnership to date. It allows the public sector to contract with the private sector for the long term provision of quality services. The public sector has the benefit of private sector management skills and reduced financial risk.
- **Maintaining stock** and responsibility for management, whilst financing repairs through the Major Repairs Allowance (ODPM).

In addition to these methods for bringing in investment, other funding options available to local authorities include:

- **The Housing Investment Programme (HIP)** – an annual allocation of credit approval by the Office of Deputy Prime Minister (ODPM) for housing improvement. This is based on an assessment of each authority's housing needs and strategy.
- **The Energy Efficiency Commitment (EEC)** – energy suppliers are set an energy saving target by Defra, which is to be achieved through domestic energy efficiency measures. (Northern Ireland has an equivalent Customer Levy).
- **Setting up an Energy Services Company (ESCO)** – a company that sells heat, power and other energy related services rather than simply fuel. ESCOs are often used to manage community heating schemes.
- **Capital receipts** – up to 25 per cent of capital receipts can be reinvested in the housing stock.
- **The Energy Saving Trust's Innovation Programme** – offers funding and technical support to local authorities, housing associations and their project partners for innovative approaches to reducing climate change.
- **Public Service Agreements** – made between a local authority and Government to deliver specific improvements with related rewards upon completion.
- **Rent revenue** – a complex option as calculating a fair relationship between the energy efficiency performance of a property and rent charges is difficult. This can also fall foul of central Government's new requirement for rents to be based on property valuations (ODPM).



When evaluating these and other funding options, whole life costing should be used. Whole life costing can help prioritise investment more realistically by moving decisions from 'first cost' to best value over the life of the building or component.

For further information on the sources of funding available in the UK – and even some European sources – the Energy Saving Trust provide a Housing Funding database. This can be found on the Energy Saving Trust website at: www.est.org.uk/housingbuildings/funding/database/

Energy efficiency measures

Brief descriptions of energy saving measures for the various parts of a building are given below. A full package of energy saving measures will produce the optimum result. See Further reading for more information.

The costs of each measure vary considerably because of differences in the height, complexity and ease of access of high rise blocks. The indicative costs given here (at fourth quarter 2004 prices) are for guide purposes only; actual costs could be higher or lower. Where available, costs are quoted for supply and installation of the measures per m² unless otherwise stated. They do not include any structural repairs required prior to implementation of these measures.

Savings quoted are the estimated annual percentage savings of space and water heating energy. The figures are based on an average two bedroom flat, currently with no wall insulation but with standard levels of roof insulation.

Wall insulation

External insulation

- Moderate to high cost.
- Suitable for solid walls and brick cavity walls (the adequacy of fixings required for concrete walls must be carefully assessed and fire regulations should be checked).
- Structural repairs may be required prior to over-cladding, which can be expensive.
- Can save up to 33 per cent of energy annually.
- Improves external appearances.
- Can effectively reduce thermal bridging.
- Can improve weather resistance of wall.
- Can avoid the need to temporarily relocate tenants.

Cost: Depending on the system and material used, the cost can range from £100 per m² for a timber rainscreen to £190-240 per m² for aluminium or galvanised steel cladding.

Where brickwork needs extensive re-pointing, or where surfaces need re-rendering, the considerable cost of remedying these deficiencies is eliminated by an external wall insulated-render system.

Internal lining

- Moderately expensive.
- Can normally be used with all construction types.
- Reduces room size slightly.
- Will not improve weather resistance of walls. Difficult to deal effectively with thermal bridging in some high rise blocks.
- Can save up to 29 per cent energy annually.

Cost: Approximately £13-33 per m² depending on material.

Cavity fill

- Low to moderate cost.
- Suitable for buildings below 25m, special assessment required for buildings above 25m.
- Possible restrictions on use because of extreme exposure of high blocks (depends on the insulation material).
- Where the external skin is rebuilt, partial cavity fill may be appropriate.
- Cavity wall stabilisation-and-insulation system may be considered where panels need stabilising, e.g. in the case of insufficient or corroded ties.
- System must have a UKAS approvals certificate and installation must be carried out by an approved contractor.
- Can save up to 19 per cent energy annually.
- CIGA (Cavity Insulation Guarantee Agency) – 25-year guarantees are available to National Insulation Association (NIA)/CIGA registered installers, covering both materials and workmanship.

Roof insulation

Adding insulation on top of existing structure

- Cost-effective when roof is being recovered or extensively repaired for weather proofing. Will require periodic maintenance.
- Can save up to 18 per cent energy annually for top floor flats.

Cost: Approximately £40-80 per m² for a warm deck roof and £65-110 per m² for an inverted deck roof.

Green roof

- Can reduce expansion and contraction of roof membranes.
- Can provide a wildlife habitat.
- Can offer good thermal insulation.

Cost: Installing a green roof, not for occupant use, can cost between £140-200 per m². A full access, intensive green roof (usable outdoor space) can cost up to £330 per m².

Constructing a pitched roof over an existing flat roof

- Easy to include insulation.
- Can make a dramatic change to the appearance of blocks.
- Structure must be checked for suitability. Annual energy savings of up to 18 per cent for top floor flats.

Floor/balcony insulation

- Insulation to soffits of exposed floors to flats, balconies and galleries.
- Over-slab insulation to balcony or gallery floors is moderately expensive.
- Should link up with wall insulation to reduce thermal bridging and condensation problems.

Windows and doors

Replacement windows

- Moderate to high cost.
- Can improve or change appearance.
- Specific building regulation requirements apply.
- Replacement units can incorporate panels to reduce large glazed areas.
- Reduce cold draughts.
- Provide 'trickle' ventilation.
- Depending on size of window, can save up to 10 per cent of energy annually.

Cost: Approximately £120-200 per m² depending on frame material and window performance.

Secondary glazing

- A separately glazed single frame fixed internally when it is difficult to replace existing windows.
- Can have similar attributes to double glazing.

Cost: Approximately £60-100 per m².

Draughtstripping existing windows

- Least cost but difficult to be totally effective with extreme exposure of high flats.
- Frames must be in good condition.
- Adequate ventilation must be achieved after fitting.

Cost: Approximately £40-60 per flat.

External doors and common entrances

- Replacement doors or draughtstripping improves comfort standard.
- Replacement doors and creation of a porch or vestibule to common entrances are cost effective when included in security access improvements.
- Landlord-controlled background heating for common areas reduces heat loss from flats.

Space heating and hot water systems

- Improved heating without good insulation may not save energy and could be costly for tenants.
- In a well-insulated flat a new, smaller heating system will provide comfort at affordable capital and running costs.
- Controls must be easy to understand and use.
- The economic provision of hot water should be considered as part of the overall heating system design.
- Hot water cylinders and pipes must be lagged.
- Consider heating the block from one central boiler as an alternative to individual boilers in each flat.
- Consider combined heat and power (CHP) as this can be very energy efficient and affordable to use. It is also possible to raise additional income from selling surplus power.
- Consider renewable energy technologies.

Ventilation

The energy saving measures described above will reduce condensation risk, particularly if a full package of measures is undertaken. However, it is critical that the dwelling is properly ventilated.

- Draughtstripping windows and doors increases the heating standards of the dwelling but can also stop warm moist air escaping, thus creating conditions for condensation.
- Mechanical or passive stack ventilation systems for internal bathrooms should be repaired or replaced.
- Humidistat-controlled extract fans should be provided in kitchens.
- Replacement windows with 'trickle' ventilators should be specified.

Opportunities to implement energy efficiency measures

General improvements	Potential for energy upgrading
Rewiring	<ul style="list-style-type: none"> • Internal wall insulation.
Refitting kitchens and bathrooms	<ul style="list-style-type: none"> • Internal wall insulation. • Double glazing. • Ventilation.
Repairing spalling concrete	<ul style="list-style-type: none"> • External insulation.
Upgrading external environment	<ul style="list-style-type: none"> • External insulation.
Repairing windows	<ul style="list-style-type: none"> • Draughtstripping.
Replacing windows	<ul style="list-style-type: none"> • New high efficiency windows. • Reduce glazed area.
Repairing heating system	<ul style="list-style-type: none"> • Higher efficiency system. • Smaller systems for insulated dwellings.
Repairing cladding	<ul style="list-style-type: none"> • External insulation.
Repairing flat roof	<ul style="list-style-type: none"> • Add insulation.
Repairing doors to balconies	<ul style="list-style-type: none"> • Insulate doors.

Sources of information

Energy Saving Trust Housing Funding database
www.est.org.uk/housingbuildings/funding/database

Energy Saving Trust Innovation Programme offers funding and technical support to local authorities, housing associations and their project partners who are addressing the threat of climate change in innovative ways.
www.est.org.uk/housingbuildings/funding/innovative/

The Energy Saving Trust, in conjunction with the Carbon Trust Community Energy Grant Scheme, provides funding and support to the Public Sector for the installation of Community Heating schemes.
www.est.org.uk/housingbuildings/funding/community/

The Carbon Trust www.carbontrust.org.uk. Tel: 0800 085 2005

Standard Assessment Procedure The Government's Standard Assessment Procedure for Energy Rating of Dwellings, 2005 Edition, DEFRA, 2005. www.bre.co.uk/sap2005

Green Street contains detailed information and advice on why and how to take action to improve the following aspects of your housing stock: energy efficiency, water efficiency, material use, waste reduction, health and wellbeing, residents' lifestyle, and the overall environmental improvement of your stock. www.greenstreet.org.uk

Public Private Partnerships Programme (4ps) 4ps is the local government procurement expert, providing advice, guidance and skills development to local authorities undertaking projects, procurement and partnerships. This includes private finance initiative (PFI) schemes, strategic service partnerships and all other forms of partnership working. www.4ps.co.uk

HM Treasury – for information on Public Service Agreements.
www.hm-treasury.gov.uk/performance

Domestic Energy Efficiency Advice Code of Practice provides a Good Practice standard for the whole of the energy efficiency advice industry. www.goodenergyadvice.org.uk

Housing Forum Constructing Excellence Guide: 20 steps to encourage the use of whole life costing.
www.constructingexcellence.org.uk/sectors/housingforum

Sustaining Tower Blocks an interactive web site, supported by the DTI, which can provide practical advice on refurbishing tower blocks. The aim of the website is to facilitate the regeneration of the 3000+ residential high rise blocks in the UK. It contains proposals for sustainable solutions integrating environmental, social and economic criteria. www.sustainingtowers.org

Further reading

The Energy Saving Trust sets energy efficiency standards that go beyond building regulations for use in the design, construction and refurbishment of homes. These standards provide an integrated package of measures covering fabric, ventilation, heating, lighting and hot water systems for all aspects of new build and renovation. Free resources including best practice guides, training seminars, technical advice and online tools, are available to help meet these standards.

The following publications may also be of interest:

Case studies

- Community Heating Aberdeen City Council (CE65)
- Newark and Sherwood District Council (CE96)

Guidance

- Internal wall insulation in existing homes (CE17/GPG138)
- Hard to treat homes and fuel poverty (CE21)
- Effective use of insulation in dwellings (CE23)
- Community Heating: a Guide (CE55)
- Energy efficient refurbishment of existing housing (CE83/GPG155))
- Domestic energy efficiency primer (CE101/GPG171)
- Using whole life costing as a basis for investments in energy efficiency (CE119)
- Energy services – briefing note on energy services
- Energy efficiency: the guide – aims to provide all of the information needed by a local authority, housing association or private landlord to develop and implement an energy efficiency strategy.
www.est.org.uk/housingbuildings/localauthorities/theguide
- An integrated approach to energy services at Woking Borough Council (GPCS434)

To obtain these publications or for more information, call 0845 120 7799, email bestpractice@est.org.uk or visit www.est.org.uk/housingbuildings

Tools

- Scottish fuel poverty indicator: Developed to assist Scottish local authorities in the preparation of their fuel poverty strategies.
- Hard to Treat Homes – Hard to treat matrix.



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